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John H. Hill

Iowa State University, johnhill@iastate.edu

Alan L. Eggenberger

Iowa State University

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Improved Disease Resistance on the Way – One Key to Soybean Improvement ICM News

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By John H. Hill and Alan L. Eggenberger, Department of Plant Pathology

As spring planting season begins, it is difficult to predict those diseases that may be most problematic during the growing season of 2008. So much depends upon rainfall, temperature and a myriad of other factors that can affect crops and pathogens. This includes potential for resistance to various pathogens. Despite all the management practices we talk about, disease resistance remains one of the most practical and economic ways to control plant disease. But, sometimes the genes that confer that resistance are not so easy to find. Iowa State University scientists, in research that would not have been possible without support by soybean check-off dollars, have recently been working to develop a means to find and characterize resistance genes to pathogens when resistance has been difficult to find.

Plants can have elaborate mechanisms to recognize and counterattack against invading pathogens. Resistance occurs when a plant resistance gene (R gene) recognizes a gene in the pathogen (avirulence determinant) and starts a complex biochemical pathway to stop the pathogen. This recognition can occur either directly or indirectly. In soybean, very little information exists on genes that are essential for these biochemical pathways that control defense against disease. Identification of the genes that are essential for resistance is key to development of disease resistant soybean varieties.

To establish a road map that will be effective for examination of resistance to a multiplicity of soybean pathogens, the interaction of the resistance gene Rsv1 with soybean mosaic virus has recently been examined. Through utilization of several different methods, two genes of the virus have been identified as the avirulence determinants. By means of a unique evolutionary approach, researchers identified specific mutations in the viral genes that result in overcoming resistance. This occurs as a result of selection pressure imposed by R genes in soybeans.

Resistance to soybean mosaic virus was chosen for study because the genetic studies of this system are much further along than for other soybean pathogens. Knowledge from these studies is being used as a guide to unravel the disease resistance network in soybean. Resulting from research supported by check-off dollars, it is revealing clues that will allow identification of genetic resistance to numerous yield-robbing soybean pathogens. Stay tuned. Improved resistance against several different problematic pathogens is on the way!

John H. Hill is a professor in the Department of Plant Pathology working on virus diseases of Iowa crops. Alan L. Eggenberger is an assistant scientist with research responsibilities on virus diseases of soybean.

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